

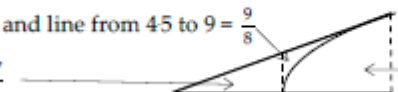
00 P1 B8	<b>4B</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>y = \int \sin(3x) dx</math></li> <li>•<sup>2</sup> <math>-\frac{1}{3} \cos(3x)</math> stated</li> <li>•<sup>3</sup> <math>1 = -\frac{1}{3} \cos(\frac{3\pi}{9}) + c</math> or equiv.</li> <li>•<sup>4</sup> <math>c = \frac{7}{6}</math></li> </ul> <p>ans: <math>y = -\frac{1}{3} \cos(3x) + \frac{7}{6}</math></p>
00 P2 B8	<b>3B</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{1}{2}(5x-4)^{-\frac{1}{2}}</math></li> <li>•<sup>2</sup> <math>\times 5</math></li> <li>•<sup>3</sup> <math>f'(4) = \frac{5}{8}</math></li> </ul>
00 P2 B10	<b>2A</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{1}{-1}(7-3x)^{-1}</math></li> <li>•<sup>2</sup> <math>\times \frac{1}{-3}</math></li> </ul> <p>ans: <math>\frac{1}{3}(7-3x)^{-1}</math></p>
01 P2 Q10	<b>4A</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\int 3 \sin(2x) dx</math> stated</li> <li>•<sup>2</sup> <math>-\frac{3}{2} \cos(2x)</math></li> <li>•<sup>3</sup> <math>\sqrt{3} = -\frac{3}{2} \cos(2 \times \frac{5}{12} \pi) + c</math></li> <li>•<sup>4</sup> <math>c = \frac{1}{4} \sqrt{3}</math> (0.4)</li> </ul> <p>ans: <math>y = -\frac{3}{2} \cos(2x) + \frac{1}{4} \sqrt{3}</math></p>
02 P1 Q10	<b>2B, 1A</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{1}{2}(8-x^3)^{-\frac{1}{2}}</math></li> <li>•<sup>2</sup> <math>\dots \times -3x^2</math></li> <li>•<sup>3</sup> <math>-\frac{2}{3} f(x)</math> or <math>-\frac{2}{3}(8-x^3)^{\frac{1}{2}}</math></li> </ul> <p>ans: <math>-\frac{3}{2} x^2 (8-x^3)^{-\frac{1}{2}}</math>  ans: <math>-\frac{2}{3} (8-x^3)^{\frac{1}{2}} + c</math></p>
02 P2 Q6	<b>4C</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{dy}{dx} = 2 \cos(x - \frac{\pi}{6})</math></li> <li>•<sup>2</sup> <math>m = \sqrt{3}</math></li> <li>•<sup>3</sup> <math>y_{x=\frac{\pi}{3}} = 1</math></li> <li>•<sup>4</sup> <math>y - 1 = \sqrt{3}(x - \frac{\pi}{3})</math></li> </ul> <p>ans: <math>y = \sqrt{3}x + 1 - \frac{\pi}{\sqrt{3}}</math></p>
02 P2 Q8	<b>4B</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>V = \int \left( 2(4-t)^{\frac{1}{2}} \right) dt</math></li> <li>•<sup>2</sup> <math>2 \times \frac{1}{-\frac{3}{2}} (4-t)^{\frac{3}{2}}</math></li> <li>•<sup>3</sup> <math>0 = 2 \times \frac{1}{-\frac{3}{2}} (4-0)^{\frac{3}{2}} + c</math></li> <li>•<sup>4</sup> <math>c = 10 \frac{2}{3}</math></li> </ul> <p>ans: <math>V = -\frac{4}{3} (4-t)^{\frac{3}{2}} + \frac{32}{3}</math></p>
5. (JAN ) 02	<b>5A</b>

P1	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>f'(x) = 2 \dots\dots</math></li> <li>•<sup>2</sup> <math>\dots\dots -18(x-4)^2</math></li> <li>•<sup>3</sup> <math>(x-4)^2 - 9 = 0</math></li> <li>•<sup>4</sup> <math>x = 1, x = 7</math></li> <li>•<sup>5</sup> <math>x &lt; 1, x &gt; 7</math></li> </ul>
6. (JAN ) 02 P2	<b>3B</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{1}{3} \sin 3x</math></li> <li>•<sup>2</sup> <math>+\frac{1}{\frac{1}{3}} \cos(\frac{1}{3}x+1)</math></li> <li>•<sup>3</sup> <math>(\frac{1}{3} \sin 3 + 3 \cos \frac{4}{3}) - 3 \cos 1 = -0.868</math></li> </ul>
03 P1 Q8	<b>4B</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>(3x+1)^{-\frac{1}{2}}</math></li> <li>•<sup>2</sup> <math>\frac{1}{\frac{1}{2}}(3x+1)^{\frac{1}{2}}</math></li> <li>•<sup>3</sup> <math>\dots \times \frac{1}{3}</math></li> <li>•<sup>4</sup> <math>\frac{2}{3}</math></li> </ul>
03 P2 Q6	<b>4B</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>f'(x) = -2 \sin(2x) + \dots</math></li> <li>•<sup>2</sup> <math>\dots\dots -12 \cos(4x)</math></li> <li>•<sup>3</sup> <math>f'(\frac{\pi}{6}) = -2 \sin(\frac{2\pi}{6}) - 12 \cos(\frac{4\pi}{6})</math></li> <li>•<sup>4</sup> <math>6 - \sqrt{3}</math></li> </ul>
04 P1 Q6	<b>3B</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>3 \cos(x)</math></li> <li>•<sup>2</sup> <math>-\sin(2x)</math></li> <li>•<sup>3</sup> <math>\times 2</math></li> </ul>
04 P1 Q7	<b>5A/B</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>(4x+1)^{\frac{1}{2}}</math></li> <li>•<sup>2</sup> <math>\frac{1}{\frac{3}{2}}(4x+1)^{\frac{4}{2}}</math></li> <li>•<sup>3</sup> <math>\div 4</math></li> <li>•<sup>4</sup> <math>\frac{1}{6}(4 \times 2 + 1)^{\frac{3}{2}} - \frac{1}{6}(4 \times 0 + 1)^{\frac{3}{2}}</math></li> <li>•<sup>5</sup> <math>\frac{13}{3}</math> <i>or equivalent fraction or mixed number</i></li> </ul>
05 P1 Q5	<b>2A</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>4(1 + 2 \sin(x))^3</math></li> <li>•<sup>2</sup> <math>\dots \times 2 \cos(x)</math></li> </ul>
06 P1 Q5	<b>7C/B</b>

	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>f'(x) = \dots\dots</math></li> <li>•<sup>2</sup> <math>5(2x-1)^4 \times 2</math></li> <li>•<sup>3</sup> <math>f'(x) = 0</math></li> <li>•<sup>4</sup> <math>x = \frac{1}{2}</math></li> <li>•<sup>5</sup> <math>f(\frac{1}{2}) = 0</math></li> <li>•<sup>6</sup> nature table</li> <li>•<sup>7</sup> pt of inflexion at <math>(\frac{1}{2}, 0)</math></li> </ul> <p>For marks •<sup>6</sup> and •<sup>7</sup>, a nature table is mandatory. The minimum amount of detail that is required is shown here:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td><td style="border-right: 1px solid black; padding: 0 10px;"><math>&lt; \frac{1}{2}</math></td><td style="border-right: 1px solid black; padding: 0 10px;"><math>\frac{1}{2}</math></td><td style="padding: 0 10px;"><math>&gt; \frac{1}{2}</math></td></tr> <tr> <td style="border-right: 1px solid black; padding: 0 10px;"><math>f'(x)</math></td><td style="text-align: center; padding: 0 10px;">+</td><td style="text-align: center; padding: 0 10px;">0</td><td style="text-align: center; padding: 0 10px;">+</td></tr> <tr> <td style="border-right: 1px solid black; padding: 0 10px;"></td><td style="text-align: center; padding: 0 10px;">∴</td><td style="text-align: center; padding: 0 10px;">...</td><td style="text-align: center; padding: 0 10px;">∴</td></tr> </table>		$< \frac{1}{2}$	$\frac{1}{2}$	$> \frac{1}{2}$	$f'(x)$	+	0	+		∴	...	∴
	$< \frac{1}{2}$	$\frac{1}{2}$	$> \frac{1}{2}$										
$f'(x)$	+	0	+										
	∴	...	∴										
06 P2 Q9	<b>4C/B</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>x^{-3}</math></li> <li>•<sup>2</sup> <math>-3x^{-4}</math></li> <li>•<sup>3</sup> <math>+\sin 2x</math></li> <li>•<sup>4</sup> <math>\times 2</math></li> </ul>												
07 P1 Q10	<b>3B</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>(3x^2 + 2)^{\frac{1}{2}}</math></li> <li>•<sup>2</sup> <math>\frac{1}{2}(3x^2 + 2)^{-\frac{1}{2}}</math></li> <li>•<sup>3</sup> <math>\times 6x</math></li> </ul>												
07 P2 Q7	<b>4B/A</b> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>-\cos(4x + 1)</math></li> <li>•<sup>2</sup> <math>\times \frac{1}{4}</math></li> <li>•<sup>3</sup> <math>-\frac{1}{4}\cos(4 \times 2 + 1) - \left(-\frac{1}{4}\cos(4 \times 0 + 1)\right)</math></li> <li>•<sup>4</sup> 0.36</li> </ul> <p><i>Alternative Method</i></p> <p style="margin-left: 40px;"><math>\sin 4x \cos 1 + \cos 4x \sin 1</math></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>-\frac{1}{4}\cos 4x \cos 1</math></li> <li>•<sup>2</sup> <math>\frac{1}{4}\sin 4x \sin 1</math></li> <li>•<sup>3</sup> <math>\left(-\frac{1}{4}\cos 8 \cos 1 + \frac{1}{4}\sin 8 \sin 1\right) - \left(-\frac{1}{4}\cos 0 \cos 1 + \frac{1}{4}\sin 0 \sin 1\right)</math></li> <li>•<sup>4</sup> 0.36</li> </ul>												
08 P2 Q3	<b>2C, 4C, 2C/B</b>												

	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>p = \sqrt{7}</math></li> <li>•<sup>2</sup> <math>q = -3</math></li> <li>•<sup>3</sup> <math>k \cos x \cos a - k \sin x \sin a</math> <i>stated explicitly</i></li> <li>•<sup>4</sup> <math>k \cos a = \sqrt{7}</math> and <math>k \sin a = 3</math> <i>stated explicitly</i></li> <li>•<sup>5</sup> <math>k = 4</math></li> <li>•<sup>6</sup> <math>a \approx 0.848</math></li> <li>•<sup>7</sup> <math>4 \cos(x + 0.848)</math></li> <li>•<sup>8</sup> <math>-4 \sin(x + 0.848)</math></li> </ul>
09 P2 Q5	<p><b>1C, 5C, 6B</b></p> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>m = 3</math> and <math>n = 2</math></li> <li>•<sup>2</sup> <math>3 \cos 2x = -4 \cos 2x + 3</math></li> <li>•<sup>3</sup> <math>\cos 2x = \frac{3}{7}</math></li> <li>•<sup>4</sup> <math>x = 0.6</math></li> <li>•<sup>5</sup> <math>x = 2.6</math></li> <li>•<sup>6</sup> <math>y = 1.3, 1.3</math></li> <li>•<sup>7</sup> <math>\int (-4 \cos 2x + 3 - 3 \cos 2x) \, dx</math></li> <li>•<sup>8</sup> <math>\int_{0.6}^{2.6}</math></li> <li>•<sup>9</sup> <math>-7 \sin 2x</math></li> <li>•<sup>10</sup> <math>3x - \frac{7}{2} \sin 2x</math></li> <li>•<sup>11</sup> <math>(3 \times 2.6 - \frac{7}{2} \sin 5.2) - (3 \times 0.6 - \frac{7}{2} \sin 1.2)</math></li> <li>•<sup>12</sup> 12.4</li> </ul>

	<p><b>Alternative for •<sup>3</sup>, •<sup>4</sup>, •<sup>5</sup></b></p> <p><b>Option 1</b></p> <p>•<sup>3</sup> <math>\cos^2 x = \frac{10}{14}</math></p> <p>•<sup>4</sup> <math>\cos x = \sqrt{\frac{10}{14}}, \cos x = -\sqrt{\frac{10}{14}}</math></p> <p>•<sup>5</sup> <math>x = 0.6 \quad x = 2.6</math></p> <p><b>Option 2</b></p> <p>•<sup>3</sup> <math>\cos^2 x = \frac{10}{14}</math></p> <p>•<sup>4</sup> <math>\cos x = \sqrt{\frac{10}{14}} \text{ and } x = 0.6</math></p> <p>•<sup>5</sup> <math>\cos x = -\sqrt{\frac{10}{14}} \text{ and } x = 2.6</math></p> <p><b>Option 3</b></p> <p>•<sup>3</sup> <math>\sin^2 x = \frac{4}{14}</math></p> <p>•<sup>4</sup> <math>\sin x = \sqrt{\frac{4}{14}}</math></p> <p>•<sup>5</sup> <math>x = 0.6, x = 2.6</math></p> <p><b>Alternative for •<sup>9</sup>, •<sup>10</sup></b></p> <p>•<sup>9</sup> <math>-4 \sin 2x - 3 \sin 2x</math></p> <p>•<sup>10</sup> <math>3x - \frac{4}{2} \sin 2x - \frac{3}{2} \sin 2x</math></p>		
10 P2 Q6	<table border="0"> <tr> <td style="vertical-align: top;"> <p>know to and start to differentiate</p> <p>complete chain rule derivative</p> <p>gradient via differentiation</p> <p>obtain <math>y_{\text{CURVE}}</math> at <math>x = 9</math></p> <p>state equation and complete</p> <p>obtain coordinates of A</p> <p>strategy for finding shaded area</p> <p>know to integrate <math>(2x-9)^{\frac{1}{2}}</math></p> <p>start integration</p> <p>complete integration</p> <p>limits <math>x_A</math> and 9</p> <p>substitute limits</p> <p>evaluate area and complete strategy</p> </td> <td style="vertical-align: top;"> <p>•<sup>1</sup> <math>\frac{1}{2}(2x-9)^{-\frac{1}{2}}</math></p> <p>•<sup>2</sup> <math>\dots \times 2</math></p> <p>•<sup>3</sup> <math>\frac{1}{3}</math></p> <p>•<sup>4</sup> 3</p> <p>•<sup>5</sup> <math>y - 3 = \frac{1}{3}(x - 9)</math> and complete to <math>y = \frac{1}{3}x</math></p> <p>•<sup>6</sup> <math>\left(\frac{9}{2}, 0\right)</math></p> <p>•<sup>7</sup> Shaded area = Area of large <math>\Delta</math> - Area under curve</p> <p>•<sup>8</sup> <math>\int (2x-9)^{\frac{1}{2}} dx</math></p> <p>•<sup>9</sup> <math>\frac{(2x-9)^{\frac{3}{2}}}{\frac{3}{2}}</math></p> <p>•<sup>10</sup> <math>\dots \times \frac{1}{2}</math></p> <p>•<sup>11</sup> <math>\frac{9}{2}</math> and 9</p> <p>•<sup>12</sup> <math>\frac{1}{3}(18-9)^{\frac{3}{2}} - 0</math></p> <p>•<sup>13</sup> <math>\frac{27}{2} - 9 = \frac{9}{2}</math> or <math>4\frac{1}{2}</math> or <math>4.5</math></p> </td> </tr> </table>	<p>know to and start to differentiate</p> <p>complete chain rule derivative</p> <p>gradient via differentiation</p> <p>obtain <math>y_{\text{CURVE}}</math> at <math>x = 9</math></p> <p>state equation and complete</p> <p>obtain coordinates of A</p> <p>strategy for finding shaded area</p> <p>know to integrate <math>(2x-9)^{\frac{1}{2}}</math></p> <p>start integration</p> <p>complete integration</p> <p>limits <math>x_A</math> and 9</p> <p>substitute limits</p> <p>evaluate area and complete strategy</p>	<p>•<sup>1</sup> <math>\frac{1}{2}(2x-9)^{-\frac{1}{2}}</math></p> <p>•<sup>2</sup> <math>\dots \times 2</math></p> <p>•<sup>3</sup> <math>\frac{1}{3}</math></p> <p>•<sup>4</sup> 3</p> <p>•<sup>5</sup> <math>y - 3 = \frac{1}{3}(x - 9)</math> and complete to <math>y = \frac{1}{3}x</math></p> <p>•<sup>6</sup> <math>\left(\frac{9}{2}, 0\right)</math></p> <p>•<sup>7</sup> Shaded area = Area of large <math>\Delta</math> - Area under curve</p> <p>•<sup>8</sup> <math>\int (2x-9)^{\frac{1}{2}} dx</math></p> <p>•<sup>9</sup> <math>\frac{(2x-9)^{\frac{3}{2}}}{\frac{3}{2}}</math></p> <p>•<sup>10</sup> <math>\dots \times \frac{1}{2}</math></p> <p>•<sup>11</sup> <math>\frac{9}{2}</math> and 9</p> <p>•<sup>12</sup> <math>\frac{1}{3}(18-9)^{\frac{3}{2}} - 0</math></p> <p>•<sup>13</sup> <math>\frac{27}{2} - 9 = \frac{9}{2}</math> or <math>4\frac{1}{2}</math> or <math>4.5</math></p>
<p>know to and start to differentiate</p> <p>complete chain rule derivative</p> <p>gradient via differentiation</p> <p>obtain <math>y_{\text{CURVE}}</math> at <math>x = 9</math></p> <p>state equation and complete</p> <p>obtain coordinates of A</p> <p>strategy for finding shaded area</p> <p>know to integrate <math>(2x-9)^{\frac{1}{2}}</math></p> <p>start integration</p> <p>complete integration</p> <p>limits <math>x_A</math> and 9</p> <p>substitute limits</p> <p>evaluate area and complete strategy</p>	<p>•<sup>1</sup> <math>\frac{1}{2}(2x-9)^{-\frac{1}{2}}</math></p> <p>•<sup>2</sup> <math>\dots \times 2</math></p> <p>•<sup>3</sup> <math>\frac{1}{3}</math></p> <p>•<sup>4</sup> 3</p> <p>•<sup>5</sup> <math>y - 3 = \frac{1}{3}(x - 9)</math> and complete to <math>y = \frac{1}{3}x</math></p> <p>•<sup>6</sup> <math>\left(\frac{9}{2}, 0\right)</math></p> <p>•<sup>7</sup> Shaded area = Area of large <math>\Delta</math> - Area under curve</p> <p>•<sup>8</sup> <math>\int (2x-9)^{\frac{1}{2}} dx</math></p> <p>•<sup>9</sup> <math>\frac{(2x-9)^{\frac{3}{2}}}{\frac{3}{2}}</math></p> <p>•<sup>10</sup> <math>\dots \times \frac{1}{2}</math></p> <p>•<sup>11</sup> <math>\frac{9}{2}</math> and 9</p> <p>•<sup>12</sup> <math>\frac{1}{3}(18-9)^{\frac{3}{2}} - 0</math></p> <p>•<sup>13</sup> <math>\frac{27}{2} - 9 = \frac{9}{2}</math> or <math>4\frac{1}{2}</math> or <math>4.5</math></p>		

	<p>strategy for finding shaded area</p> <p>know to integrate <math>(2x-9)^{\frac{1}{2}}</math></p> <p>start integration</p> <p>complete integration</p> <p>limits <math>x_A</math> and 9</p> <p>'upper - lower' and substitute limits</p> <p>evaluate area and complete strategy</p> <p>You may find the following helpful in marking this question:</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>Area between curve and line from 4.5 to 9 = <math>\frac{9}{8}</math></p> <p>Area of <math>\Delta_{\text{SMALLER}} = \frac{27}{8}</math></p> </div>  <div style="margin-left: 20px;"> <p>Area of <math>\Delta_{\text{LARGER}} = 13.5</math> or <math>\frac{27}{2}</math></p> <p>Area under curve from 4.5 to 9 = 9</p> </div> </div>	<ul style="list-style-type: none"> <li>•<sup>7</sup> Area of small <math>\Delta</math> + area between line and curve</li> <li>•<sup>8</sup> <math>\int \dots (2x-9)^{\frac{1}{2}} dx</math></li> <li>•<sup>9</sup> <math>\dots \frac{(2x-9)^{\frac{3}{2}}}{\frac{3}{2}}</math></li> <li>•<sup>10</sup> <math>\dots \times \frac{1}{2}</math></li> <li>•<sup>11</sup> <math>\frac{9}{2}</math> and 9</li> <li>•<sup>12</sup> <math>\left( \frac{1}{6} \times 9^2 - \frac{1}{3} (18-9)^{\frac{3}{2}} \right) - \left( \frac{1}{6} \times \left( \frac{9}{2} \right)^2 - \frac{1}{3} (9-9)^{\frac{3}{2}} \right)</math></li> <li>•<sup>13</sup> <math>\frac{27}{8} + \frac{9}{8} = \frac{9}{2}</math> or <math>4\frac{1}{2}</math> or <math>4.5</math></li> </ul>
11 P2 Q6	<p>use compound angle formula</p> <p>compare coefficients</p> <p>process <math>R</math></p> <p>process <math>a</math></p> <p>integrate given expression</p> <p>substitute limits</p> <p>process limits</p> <p>know to use wave equation</p> <p>write in standard format</p> <p>start to solve equation</p> <p>complete and state solution</p>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>R \sin x \cos a + R \cos x \sin a</math> <b>stated</b></li> <li>•<sup>2</sup> <math>R \cos a = 3</math> and <math>R \sin a = -5</math> <b>stated</b></li> <li>•<sup>3</sup> <math>\sqrt{34}</math> (Accept <math>5.8</math>)</li> <li>•<sup>4</sup> <math>5.253</math> (Accept <math>5.3</math>)</li> <li>•<sup>5</sup> <math>3 \sin x - 5 \cos x</math></li> <li>•<sup>6</sup> <math>(3 \sin t - 5 \cos t) - (3 \sin 0 - 5 \cos 0)</math></li> <li>•<sup>7</sup> <math>3 \sin t - 5 \cos t + 5</math></li> <li>•<sup>8</sup> <math>\sqrt{34} \sin(t + 5.3) + 5</math></li> <li>•<sup>9</sup> <math>\sin(t + 5.3) = -\frac{2}{\sqrt{34}}</math></li> <li>•<sup>10</sup> <math>t + 5.3 = 3.5</math> and <math>5.9</math></li> <li>•<sup>11</sup> <math>t = 0.6</math></li> </ul>
13 P2 Q6	<p>integrate correctly</p> <p>process limits</p> <p>evaluate and form a correct equation</p> <p>start to solve equation</p> <p>solve for <math>a</math></p>	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\left[ \frac{-5}{3} \cos 3x \right]</math></li> <li>•<sup>2</sup> <math>\frac{-5}{3} \cos 3a + \frac{5}{3} \cos 0</math></li> <li>•<sup>3</sup> <math>\frac{-5}{3} \cos 3a + \frac{5}{3} = \frac{10}{3}</math></li> <li>•<sup>4</sup> <math>\cos 3a = -1</math></li> <li>•<sup>5</sup> <math>a = \frac{\pi}{3}</math></li> </ul>

14 P2 Q5	<p>start to integrate</p> <p>complete integration</p> <p>process limits</p> <p>start to solve equation</p> <p>solve for <math>t</math></p>	<p>•<sup>1</sup> <math>\frac{1}{\frac{1}{2}}(\dots)^{\frac{1}{2}}</math></p> <p>•<sup>2</sup> <math>\dots \times \frac{1}{3}</math></p> <p>•<sup>3</sup> <math>\frac{2}{3}(3t+4)^{\frac{1}{2}} - \frac{2}{3}(3(4)+4)^{\frac{1}{2}}</math></p> <p>•<sup>4</sup> <math>(3t+4)^{\frac{1}{2}} = 7</math></p> <p>•<sup>5</sup> <math>t = 15</math></p>
14 P2 Q9	<p>know to differentiate</p> <p>differentiates trig. function</p> <p>applies chain rule</p> <p>know to and evaluate <math>a(10)</math></p> <p>interpret result</p> <p>know to integrate</p> <p>integrate correctly</p> <p>determine constant and complete</p>	<p>•<sup>1</sup> <math>a = v'(t)</math></p> <p>•<sup>2</sup> <math>-8 \sin\left(2t - \frac{\pi}{2}\right) \dots\dots\dots</math></p> <p>•<sup>3</sup> <math>\dots\dots\dots \times 2</math> and complete  <math>a(t) = -16 \sin\left(2t - \frac{\pi}{2}\right)</math></p> <p>•<sup>4</sup> <math>a(10) = 6.53</math></p> <p>•<sup>5</sup> <math>a(10) &gt; 0</math> therefore increasing</p> <p>•<sup>6</sup> <math>s(t) = \int v(t) dt</math></p> <p>•<sup>7</sup> <math>s(t) = 4 \sin\left(2t - \frac{\pi}{2}\right) + c</math></p> <p>•<sup>8</sup> <math>c = 8</math> so <math>s(t) = 4 \sin\left(2t - \frac{\pi}{2}\right) + 8</math></p>

PRE 2000 ANSWERS – Differentiation

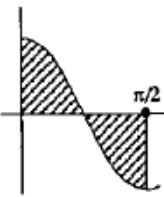
1	<p>•<sup>1</sup> <math>(7-2x)^2</math></p> <p>•<sup>2</sup> <math>\times 15</math></p> <p>•<sup>3</sup> <math>\times -2</math></p> <p>•<sup>4</sup> <math>-30</math></p>
2	<p>•<sup>1</sup> <math>x^{-3}</math> stated or implied by •<sup>2</sup></p> <p>•<sup>2</sup> <math>-3x^{-4}</math></p> <p>•<sup>3</sup> <math>-\sin 3x</math></p> <p>•<sup>4</sup> <math>\times 3</math></p>

3	<ul style="list-style-type: none"><li>•<sup>1</sup> <math>4x^{\frac{1}{2}}</math></li><li>•<sup>2</sup> <math>2x^{-\frac{1}{2}}</math></li><li>•<sup>3</sup> <math>-\sin 2x</math></li><li>•<sup>4</sup> <math>\times 2</math></li></ul>																		
4	<ul style="list-style-type: none"><li>•<sup>1</sup> <math>2x^{-\frac{1}{2}}</math></li><li>•<sup>2</sup> <math>\cos 2x</math></li><li>•<sup>3</sup> <math>\times 2</math></li><li>•<sup>4</sup> <math>-x^{-\frac{3}{2}}</math></li></ul>																		
5	<ul style="list-style-type: none"><li>•<sup>1</sup> <math>(1+\cos x)^{\frac{1}{2}}</math> stated or implied by •<sup>2</sup></li><li>•<sup>2</sup> <math>\frac{1}{2}(1+\cos x)^{-\frac{1}{2}}</math></li><li>•<sup>3</sup> <math>\times -\sin x</math></li></ul>																		
6	<ul style="list-style-type: none"><li>•<sup>1</sup> <math>3x^{\frac{1}{2}}</math></li><li>•<sup>2</sup> <math>(\sin x)^2</math> stated or implied by •<sup>3</sup></li><li>•<sup>3</sup> <math>2 \sin x</math></li><li>•<sup>4</sup> <math>\times \cos x</math></li></ul>																		
7	<ul style="list-style-type: none"><li>•<sup>1</sup> <math>-\frac{2}{3}x^{-2}</math></li><li>•<sup>2</sup> <math>2 \cos x</math></li><li>•<sup>3</sup> <math>\times (-\sin x)</math></li><li>•<sup>4</sup> <math>\frac{4}{3}x^{-3}</math></li></ul>																		
8	<table><tr><td rowspan="3"><ul style="list-style-type: none"><li>•<sup>1</sup> <math>f(x) = \cos 2x</math></li><li>•<sup>2</sup> <math>-\sin 2x</math></li><li>•<sup>3</sup> <math>\times 2</math></li></ul></td><td>For <math>\frac{d}{dx}(\cos^2 x)</math></td><td>OR</td><td>For <math>\frac{d}{dx}(-\sin^2 x)</math></td></tr><tr><td>•<sup>1</sup> <math>2 \cos x</math></td><td></td><td>•<sup>1</sup> <math>-2 \sin x</math></td></tr><tr><td>•<sup>2</sup> <math>\times -\sin x</math></td><td></td><td>•<sup>2</sup> <math>\times \cos x</math></td></tr><tr><td></td><td>For <math>\frac{d}{dx}(-\sin^2 x)</math></td><td></td><td>For <math>\frac{d}{dx}(\cos^2 x)</math></td></tr><tr><td></td><td>•<sup>3</sup> <math>-2 \sin x \times \cos x</math></td><td></td><td>•<sup>3</sup> <math>2 \cos x \times -\sin x</math></td></tr></table>	<ul style="list-style-type: none"><li>•<sup>1</sup> <math>f(x) = \cos 2x</math></li><li>•<sup>2</sup> <math>-\sin 2x</math></li><li>•<sup>3</sup> <math>\times 2</math></li></ul>	For $\frac{d}{dx}(\cos^2 x)$	OR	For $\frac{d}{dx}(-\sin^2 x)$	• <sup>1</sup> $2 \cos x$		• <sup>1</sup> $-2 \sin x$	• <sup>2</sup> $\times -\sin x$		• <sup>2</sup> $\times \cos x$		For $\frac{d}{dx}(-\sin^2 x)$		For $\frac{d}{dx}(\cos^2 x)$		• <sup>3</sup> $-2 \sin x \times \cos x$		• <sup>3</sup> $2 \cos x \times -\sin x$
<ul style="list-style-type: none"><li>•<sup>1</sup> <math>f(x) = \cos 2x</math></li><li>•<sup>2</sup> <math>-\sin 2x</math></li><li>•<sup>3</sup> <math>\times 2</math></li></ul>	For $\frac{d}{dx}(\cos^2 x)$		OR	For $\frac{d}{dx}(-\sin^2 x)$															
	• <sup>1</sup> $2 \cos x$			• <sup>1</sup> $-2 \sin x$															
	• <sup>2</sup> $\times -\sin x$		• <sup>2</sup> $\times \cos x$																
	For $\frac{d}{dx}(-\sin^2 x)$		For $\frac{d}{dx}(\cos^2 x)$																
	• <sup>3</sup> $-2 \sin x \times \cos x$		• <sup>3</sup> $2 \cos x \times -\sin x$																
9	<table><tr><td rowspan="3"><ul style="list-style-type: none"><li>•<sup>1</sup> <math>2(\sin x + 1)</math></li><li>•<sup>2</sup> <math>\times \cos x</math></li><li>•<sup>3</sup> <math>\frac{3\sqrt{3}}{2}</math></li></ul></td><td>Alternative</td><td>•<sup>1</sup> expand and differentiate <math>2 \sin x + 1</math></td></tr><tr><td></td><td>•<sup>2</sup> differentiate <math>\sin^2 x</math></td></tr><tr><td></td><td>•<sup>3</sup> <math>\frac{3\sqrt{3}}{2}</math></td></tr></table>	<ul style="list-style-type: none"><li>•<sup>1</sup> <math>2(\sin x + 1)</math></li><li>•<sup>2</sup> <math>\times \cos x</math></li><li>•<sup>3</sup> <math>\frac{3\sqrt{3}}{2}</math></li></ul>	Alternative	• <sup>1</sup> expand and differentiate $2 \sin x + 1$		• <sup>2</sup> differentiate $\sin^2 x$		• <sup>3</sup> $\frac{3\sqrt{3}}{2}$											
<ul style="list-style-type: none"><li>•<sup>1</sup> <math>2(\sin x + 1)</math></li><li>•<sup>2</sup> <math>\times \cos x</math></li><li>•<sup>3</sup> <math>\frac{3\sqrt{3}}{2}</math></li></ul>	Alternative		• <sup>1</sup> expand and differentiate $2 \sin x + 1$																
			• <sup>2</sup> differentiate $\sin^2 x$																
		• <sup>3</sup> $\frac{3\sqrt{3}}{2}$																	
10	<ul style="list-style-type: none"><li>•<sup>1</sup> <math>\frac{dy}{dx} = \dots</math></li><li>•<sup>2</sup> <math>5 \times \left(-\frac{1}{2} \sin \frac{1}{2} x\right)</math></li><li>•<sup>3</sup> <math>m = \frac{5}{4}</math></li><li>•<sup>4</sup> <math>\theta = 51.3^\circ</math></li></ul>																		
11	<ul style="list-style-type: none"><li>•<sup>1</sup> show that <math>f'(x) &lt; 0</math></li><li>•<sup>2</sup> <math>f(x) = (x+1)^{-1}</math></li><li>•<sup>3</sup> <math>f'(x) = \frac{-1}{(x+1)^2}</math></li><li>•<sup>4</sup> explaining that <math>(x+1)^2 &gt; 0 \Rightarrow f'(x) &lt; 0</math></li></ul>																		



12	<ul style="list-style-type: none"> <li>•<sup>1</sup> sketch to have zeroes at <math>x=0, a, b</math></li> <li>•<sup>2</sup> <math>f(x) &lt; 0</math> for <math>0 &lt; x &lt; a</math> <b>and</b> a minimum turning point in <math>0 &lt; x &lt; a</math></li> <li>•<sup>3</sup> <math>f(x) &gt; 0</math> for <math>a &lt; x &lt; b</math> <b>and</b> a maximum turning point in <math>a &lt; x &lt; b</math></li> <li>•<sup>4</sup> e.g. <math>f'(x) = -\sin x</math>, <math>f'(x) = \cos(x+90)</math>, <math>f'(x) = \sin(x-180)</math>, <math>f'(x) = kx(x-\pi)(x-2\pi)</math></li> </ul>
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# PRE 2000 ANSWERS – Further Integration

1	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>(1+3x)^{\frac{1}{2}}</math></li> <li>•<sup>2</sup> <math>\frac{1}{\frac{3}{2}}(1+3x)^{\frac{3}{2}}</math></li> <li>•<sup>3</sup> <math>+3</math></li> <li>•<sup>4</sup> <math>\frac{14}{9}</math></li> </ul>	
2	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{1}{3}(2x+3)^3</math></li> <li>•<sup>2</sup> <math>+2</math></li> <li>•<sup>3</sup> <math>\frac{1}{6}(3)^3 - \frac{1}{6}(-6+3)^3</math></li> <li>•<sup>4</sup> <math>9</math></li> </ul>	<p>OR</p> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{4}{3}x^3</math></li> <li>•<sup>2</sup> <math>6x^2 + 9x</math></li> <li>•<sup>3</sup> <math>[0] - \left[ \frac{4}{3}(-3)^3 + 6(-3)^2 + 9(-3) \right]</math></li> <li>•<sup>4</sup> <math>9</math></li> </ul>
3	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>2x^3</math></li> <li>•<sup>2</sup> <math>-\frac{1}{2}x^2</math></li> <li>•<sup>3</sup> <math>\sin x</math></li> <li>•<sup>4</sup> <math>+c</math></li> </ul>	
4	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>p = \frac{\pi}{2}</math> and <math>q = \frac{3\pi}{4}</math></li> </ul>	<ul style="list-style-type: none"> <li>•<sup>2</sup> <math>\int_{\frac{\pi}{2}}^{\frac{3\pi}{4}} (\sin 2x) dx</math></li> <li>•<sup>3</sup> <math>-\frac{1}{2} \cos 2x</math></li> <li>•<sup>4</sup> <math>-\frac{1}{2}</math></li> <li>•<sup>5</sup> deal with - ve correctly giving <math>\frac{1}{2}</math></li> </ul>
5	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{1}{2}</math></li> <li>•<sup>2</sup> <math>\sin 2x</math></li> <li>•<sup>3</sup> <math>0</math></li> <li>•<sup>4</sup> diagram</li> <li>•<sup>5</sup> +ve and - ve cancel out</li> </ul>	
6	<ul style="list-style-type: none"> <li>•<sup>1</sup> evidence of two integrals</li> <li>•<sup>2</sup> <math>\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \cos 2x dx</math> and <math>\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \cos 2x dx</math></li> <li>•<sup>3</sup> <math>\frac{1}{2} \sin 2x</math></li> <li>•<sup>4</sup> <math>\frac{1}{2} \sin \frac{\pi}{2} - \frac{1}{2} \sin \frac{\pi}{3} = \frac{1}{2} - \frac{\sqrt{3}}{4}</math></li> <li>•<sup>5</sup> <math>\frac{1}{2} \sin \pi - \frac{1}{2} \sin \frac{\pi}{2} = -\frac{1}{2}</math></li> <li>•<sup>6</sup> <math>1 - \frac{\sqrt{3}}{4}</math></li> </ul>	

7	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\sin^2 x + \cos^2 x + 2 \sin x \cos x</math> and complete</li> <li>•<sup>2</sup> <math>x + c</math></li> <li>•<sup>3</sup> <math>-\cos 2x</math></li> <li>•<sup>4</sup> <math>\times \frac{1}{2}</math></li> </ul>
8	<ul style="list-style-type: none"> <li>•<sup>1</sup> using <math>(\sin x)^3</math> stated or implied by •<sup>2</sup></li> <li>•<sup>2</sup> <math>3 \sin^2 x</math></li> <li>•<sup>3</sup> <math>\times \cos x</math></li> <li>•<sup>4</sup> <math>\frac{1}{3} \sin^3 x</math></li> </ul>
9	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>(a)</p> <ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\sin 2x \cos x + \cos 2x \sin x</math></li> <li>•<sup>2</sup> <math>2 \sin x \cos x \cos x + \dots\dots\dots</math></li> <li>•<sup>3</sup> <math>\dots\dots\dots + (1 - 2 \sin^2 x) \sin x</math></li> <li>•<sup>4</sup> <math>2 \sin x - 2 \sin^3 x + \sin x - 2 \sin^3 x</math></li> </ul> </div> <div style="width: 45%;"> <p>(b)</p> <ul style="list-style-type: none"> <li>•<sup>5</sup> <math>\int \frac{1}{4} (3 \sin x - \sin 3x) dx</math></li> <li>•<sup>6</sup> <math>-3 \cos x</math></li> <li>•<sup>7</sup> <math>+ \cos 3x</math></li> <li>•<sup>8</sup> <math>+3</math></li> </ul> </div> </div>
10	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>(a)</p> <ul style="list-style-type: none"> <li>•<sup>1</sup> strategy: know to integrate</li> <li>•<sup>2</sup> <math>\int_0^2 (2x - x^2) dx</math></li> <li>•<sup>3</sup> <math>x^2 - \frac{1}{3}x^3</math></li> <li>•<sup>4</sup> <math>1\frac{1}{3} \text{ units}^2</math></li> </ul> <p>(b)</p> <ul style="list-style-type: none"> <li>•<sup>5</sup> strategy: use area to find <math>p</math></li> <li>•<sup>6</sup> <math>p = \frac{4}{\sqrt{3}}</math> or equivalent</li> </ul> </div> <div style="width: 45%;"> <p>(c)</p> <ul style="list-style-type: none"> <li>•<sup>7</sup> <math>\int (\sin x - \cos x) dx</math></li> <li>•<sup>8</sup> for the limits <math>\int_{\frac{\pi}{4}}^q</math></li> <li>•<sup>9</sup> <math>[-\cos x - \sin x]</math></li> <li>•<sup>10</sup> <math>-\cos q - \sin q + \sqrt{2}</math></li> <li>•<sup>11</sup> <math>\sqrt{2} - \frac{4}{3} = 0.081</math></li> <li>•<sup>12</sup> strategy: eg <math>k \cos(q - \alpha)</math></li> <li>•<sup>13</sup> <math>k = \sqrt{2}</math></li> <li>•<sup>14</sup> <math>\alpha = \frac{\pi}{4}</math></li> <li>•<sup>15</sup> <math>\cos\left(q - \frac{\pi}{4}\right) = \frac{0.081}{\sqrt{2}}</math></li> <li>•<sup>16</sup> <math>q = 2.3</math></li> </ul> </div> </div>

PRE 2000 ANSWERS – Differential Equations

1	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\int f'(x) dx</math></li> <li>•<sup>2</sup> <math>x^2 - 3x</math></li> <li>•<sup>3</sup> use (0, 4) to find c</li> <li>•<sup>4</sup> <math>f(x) = x^2 - 3x + 4</math></li> </ul>
2	<ul style="list-style-type: none"> <li>•<sup>1</sup> <math>\frac{1}{2} \sin 2x</math></li> <li>•<sup>2</sup> <math>1 = \frac{1}{2} \sin \frac{\pi}{6} + c</math></li> <li>•<sup>3</sup> <math>c = \frac{3}{4}</math></li> </ul>

